

CLAIM AMENDMENTS

- 1 1. (Currently amended) A method of determining placement of components in a
2 rack comprising the steps of:
 - 3 a. providing a rack height, a set of components, and a height for each
4 component in the set of components;
 - 5 b. determining a placement of the components in the rack according to
6 constraints; and
 - 7 c. evaluating the placement of the components according to an objective.
- 1 2. (Currently amended) The method of claim 1 wherein the constraints
2 comprise:
 - 3 a. a rack height constraint which requires that placement of a particular
4 component does not result in a top height of the particular component
5 exceeding the rack height;
 - 6 b. a single placement constraint which requires that each component be
7 placed once and only once; and
 - 8 c. a non-overlapping constraint which requires that each slot in the rack be
9 occupied by no more than a single component.
- 1 3. (Original) The method of claim 2 wherein the constraints further comprise
2 a height preference constraint which prefers that a first component be placed
3 above a second component.
- 1 4. (Currently amended) The method of claim 1 wherein the step of determining
2 placement of the components according to the constraints finds that at least one of
3 the constraints cannot be met and further comprising the steps of:
 - 4 a. relaxing a particular constraint; and
 - 5 b. determining placement of the components according to remaining
6 constraints.
- 1 5. (Original) The method of claim 4 wherein the step of relaxing the
2 particular constraint comprises providing a choice of relaxation constraints to a

3 user and the user selecting the particular constraint from the choice of relaxation
4 constraints.

1 6. (Original) The method of claim 1 further comprising the step of providing
2 a weight and a weight distribution for each component in the set of components.

1 7. (Original) The method of claim 6 wherein the step of evaluating the
2 placement of the components in the rack according to the objective comprises
3 seeking a minimum height for the center of gravity.

1 8. (Original) The method of claim 6 wherein the step of evaluating the
2 placement of the components in the rack according to the objective comprises
3 ensuring that a height of the center of gravity does not exceed a selected height.

1 9. (Original) The method of claim 1 further comprising the step of providing
2 a placement height range for a particular component, wherein the placement
3 height range comprises a minimum height and a maximum height.

1 10. (Original) The method of claim 9 wherein the placement height range is
2 increased, thereby forming an increase in the placement height range, and further
3 wherein a penalty is applied to the objective according to the increase in the
4 placement height range.

1 11. (Original) The method of claim 1 further comprising the step of providing
2 an empty space requirement for a particular component.

1 12. (Original) The method of claim 11 wherein the empty space requirement
2 is selected from the group consisting of an empty space requirement above the
3 particular component and an empty space component below the particular
4 component.

1 13. (Original) The method of claim 11 wherein the empty space requirement
2 is relaxed, thereby forming a relaxation of the empty space requirement, and

3 further wherein a penalty is applied to the objective according to the relaxation of
4 the empty space requirement.

1 14. (Original) The method of claim 1 wherein the steps of determining and
2 evaluating the placement of the components comprise the step of employing a
3 mixed integer programming technique.

1 15. (Original) The method of claim 14 wherein the step of employing the
2 mixed integer programming technique employs a heuristic approach.

1 16. (Original) The method of claim 1 further comprising a contiguous
2 placement constraint for at least two of the components within the set of
3 components.

1 17. (Original) The method of claim 16 wherein the step of determining the
2 placement of the components in the rack according to the constraints comprises
3 forming a virtual component from the at least two components according to the
4 contiguous placement constraint and further wherein remaining constraints
5 determine placement of the virtual component.

1 18. (Original) The method of claim 1 further comprising the step of
2 evaluating the placement of the components according to a second objective.

1 19. (Original) The method of claim 1 further comprising the step of
2 evaluating the placement of the components according to additional objectives.

1 20. (Original) The method of claim 1 wherein the constraints comprise hard
2 constraints.

1 21. (Original) The method of claim 1 wherein the objective comprises a soft
2 constraint.

1 22. (Original) The method of claim 1 wherein the objective comprises a sum
2 of soft constraints.

1 23. (Currently amended) A method of determining placement of components in a
2 rack comprising the steps of:

- 3 ~~a.~~ providing a rack height, a set of components, and, for each component in
4 the set of components, a height, a weight, and a weight distribution;
- 5 ~~b.~~ determining a placement of the components in the rack according to
6 constraints, wherein the constraints comprise:
 - 7 ~~i.~~ a rack height constraint which requires that placement of a particular
8 component does not result in a top height of the particular component
9 exceeding the rack height;
 - 10 ~~ii.~~ a single placement constraint which requires that each component be
11 placed once and only once; and
 - 12 ~~iii.~~ a non-overlapping constraint which requires that each slot in the rack
13 be occupied by no more than a single component; and
- 14 ~~e.~~ evaluating the placement of the components by seeking a minimum height
15 for a center of gravity of the components.

1 24. (Currently amended) A computer readable memory comprising computer
2 code for directing a computer to make a determination of placement of
3 components in a rack, the determination of the placement of the components
4 comprising the steps of:

- 5 ~~a.~~ obtaining a rack height, a set of components, and a height for each
6 component in the set of components;
- 7 ~~b.~~ determining a placement of the components in the rack according to
8 constraints; and
- 9 ~~e.~~ evaluating the placement of the components according to an objective.

1 25. (Currently amended) The computer readable memory of claim 24 wherein the
2 constraints comprise:

- 3 ~~a.~~ a rack height constraint which requires that placement of a particular
4 component does not result in a top height of the particular component
5 exceeding the rack height;
- 6 ~~b.~~ a single placement constraint which requires that each component be
7 placed once and only once; and

8 e. a non-overlapping constraint which requires that each slot in the rack be
9 occupied by no more than a single component.

1 26. (Currently amended) The computer readable memory of claim 24 wherein the
2 step of determining placement of the components according to the constraints
3 finds that at least one of the constraints cannot be met and further comprising the
4 steps of:

5 a. relaxing a particular constraint; and

6 b. determining placement of the components according to remaining
7 constraints.

1 27. (Original) The computer readable memory of claim 26 wherein the step of
2 relaxing the particular constraint comprises providing a choice of relaxation
3 constraints to a user and the user selecting the particular constraint from the
4 choice of relaxation constraints.

1 28. (Original) The computer readable memory of claim 24 further comprising
2 the step of obtaining a weight and a weight distribution for each component in the
3 set of components.

1 29. (Original) The computer readable memory of claim 28 wherein the step of
2 evaluating the placement of the components in the rack according to the objective
3 comprises seeking a minimum height for the center of gravity.

1 30. (Original) The computer readable memory of claim 28 wherein the step of
2 evaluating the placement of the components in the rack according to the objective
3 comprises ensuring that a height of the center of gravity does not exceed a
4 selected height.

1 31. (Original) The computer readable memory of claim 24 wherein the step of
2 evaluating the placement of the components comprises the step of employing a
3 mixed integer programming technique.

1 32. (Original) The computer readable memory of claim 31 wherein the step of
2 employing the mixed integer programming technique employs a heuristic
3 approach.

1 33. (Currently amended) A computer readable memory comprising computer
2 code for directing a computer to make a determination of placement of
3 components in a rack, the determination of the placement of the components
4 comprising the steps of:

5 a. obtaining a rack height, a set of components, and, for each component in
6 the set of components, a height, a weight, and a weight distribution;

7 b. determining a placement of the components in the rack according to
8 constraints, wherein the constraints comprise:

9 i. a rack height constraint which requires that placement of a particular
10 component does not result in a top height of the particular component
11 exceeding the rack height;

12 ii. a single placement constraint which requires that each component be
13 placed once and only once; and

14 iii. a non-overlapping constraint which requires that each slot in the rack
15 be occupied by no more than a single component; and

16 e. evaluating the placement of the components by seeking a minimum height
17 for a center of gravity of the components.